CHAPTER 10

Treatment of Obesity

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INTRODUCTION

Obesity constitutes a major threat to health. Excess body weight contributes significantly to many chronic diseases, to diminished quality of life, and to decreased longevity. Despite the gravity of its consequences, success in the treatment of obesity has proven elusive. The identification of effective methods for long-term weight management continues to present a major challenge to health professionals and obese persons alike. In this chapter, we provide an overview of current treatments for obesity, including behavioral, pharmacological, and surgical methods. We begin with a context for understanding obesity as a major threat to public health. We review the increasing worldwide prevalence of obesity, and document the deleterious impact of excess weight on health and longevity. Next, we describe empirically tested treatments for obesity and evaluate methods designed to improve the maintenance of weight lost. We conclude the chapter with some specific recommendations for the clinical management of obesity.

Defining Obesity

Obesity refers to an excess accumulation of adipose tissue. However, direct and accurate measurement of total body fat is technically difficult and expensive (NHLBI, 1998). Thus, surrogate measures that rely on the weight-to-height ratio are commonly used. The Body Mass Index (BMI), calculated as weight in kilograms divided by the square of the height in meters (kg/m²), has gained acceptance as the preferred surrogate method for classifying overweight and obesity in adults. For most individuals, BMI corresponds relatively closely to degree of adiposity (NHLBI, 1998).

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The World Health Organization (WHO, 1998) has developed a graded classification system for categorizing overweight and obesity in adults according to BMI. In the WHO system, overweight is defined as a BMI ≥ 25, and obesity is defined as a BMI ≥ 30. The WHO system employs six categories selected on the basis of the known risks of comorbid conditions associated with different BMI levels (see Table 10.1). For example, the risk of comorbid conditions is considered “average” in the normal weight category (BMI = 18.5–24.9) and “very severe” in the highest weight category, Class III obesity (BMI ≥ 40).

### Prevalence

The past two decades have witnessed a striking increase in the rates of overweight and obesity throughout the industrialized world. In the United States, the prevalence of obesity has shown a marked increase over the past two decades, and the majority of adults (54%) are now overweight or obese (Flegal et al., 1998). European countries have observed increases of 10–40% in the prevalence of obesity (WHO, 1998). The most dramatic rise has been in the United Kingdom where the prevalence of obesity has more than doubled since 1980 (Department of Health, 2001). Figure 10.1 illustrates the changes in the prevalence of overweight and obesity in selected industrialized nations over the past two decades.

### Seriousness of Obesity

Concern over the rising rates of obesity stems from clear evidence showing that excess weight has an adverse impact on health and longevity. Obesity-related conditions include hypertension, dyslipidemia, type 2 diabetes mellitus, coronary heart disease, stroke, osteoarthritis, respiratory disease, and certain types of cancer (NHLBI, 1998; WHO, 1998). The health risks associated with obesity also vary according to body fat distribution. Abdominal obesity (i.e., a waist circumference of >40 inches in men or >35 inches in women) confers increased risk for morbidity and mortality due to metabolic disorders and cardiovascular diseases (James, 1996; Melanson et al., 2001; NHLBI, 1998; Turcato et al., 2000).

The impact of obesity on life expectancy varies according to degree of overweight. Mortality ratios rise above average as BMI exceeds 25, and all-cause mortality rates increase by 50–100% when BMI surpasses 30 (Troiano et al., 1996). In the USA, more than 300 000

### Table 10.1 World Health Organization classification system of overweight based on Body Mass Index

<table>
<thead>
<tr>
<th>BMI</th>
<th>Category</th>
<th>Risk for comorbid conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18.5</td>
<td>Underweight</td>
<td>Low&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>18.5–24.9</td>
<td>Normal weight</td>
<td>Average</td>
</tr>
<tr>
<td>25.0–29.9</td>
<td>Pre-obese</td>
<td>Increased</td>
</tr>
<tr>
<td>30.0–34.9</td>
<td>Obese Class I</td>
<td>Moderate</td>
</tr>
<tr>
<td>35.0–39.9</td>
<td>Obese Class II</td>
<td>Severe</td>
</tr>
<tr>
<td>≥40.0</td>
<td>Obesity Class III</td>
<td>Very severe</td>
</tr>
</tbody>
</table>

<sup>a</sup>Risk for other clinical problems may be increased.
deaths per year are attributable to obesity-related causes (Allison et al., 1999), making obesity second only to smoking as the leading lifestyle contributor to mortality.

In addition to its adverse impact on health and longevity, obesity also diminishes quality of life (Wadden & Stunkard, 1993). Many obese persons experience social discrimination as a direct consequence of their obesity. For women, the psychological consequences may be particularly severe. The results of a large-scale, epidemiological study (Carpenter et al., 2000) recently showed that obesity was associated with major depressive disorder, suicidal ideation, and suicide attempts among women but not among men.

**Causes of Obesity**

Some individuals may be predisposed to obesity by genetic factors that control the regulation of body weight through energy intake, expenditure, and storage (Chagnon et al., 2000; Feitosa et al., 2000; Levin, 2000). Among the first genetic defects linked to obesity was the discovery of the ob gene and its protein product leptin (Zhang et al., 1994). Leptin, a hormone produced by fat cells, influences hypothalamic regulation of caloric consumption and energy expenditure. Laboratory mice that fail to produce leptin due to a genetic defect become obese as the result of excess energy intake and physical inactivity (Zhang et al., 1994). Moreover, the administration of recombinant leptin in such animals decreases food intake, increases physical activity, and reduces body weight (Campfield et al., 1995). In humans, however, only a very small percentage of obese individuals have leptin deficiencies (Montague et al., 1997), and trials of recombinant leptin as treatment for obesity have yielded relatively disappointing results (Heymsfield et al., 1999).
Several other single-gene defects have been discovered that contribute to obesity in animals (e.g., Levin, 2000). However, only one of these mutations (i.e., on the melanocortin-4 receptor) appears to be a contributor to human obesity, and it is been found to affect fewer than 4% of morbidly obese individuals (Farooqi et al., 2000; Vaisse et al., 2000). Moreover, because the human genome has not changed over the past 20 years, genetic factors alone cannot account for the recent rise in the prevalence of obesity. Rather, environmental changes that contribute to physical inactivity and the consumption of energy-dense diets constitute the fundamental causes of the current epidemic of obesity (Brownell, 1998; Poston & Foreyt, 1999).

In industrialized countries, people are exposed to an environment that promotes the overconsumption of energy-dense, nutrient-poor foods (Brownell, 1998; Kant, 2000). Tasty, low-cost, high-calorie items are readily available not only at fast-food restaurants, but also in supermarkets, food courts, vending machines, and even 24-hour service stations. Larger portion sizes, “supersizing”, “value meals”, and “2-for-1” deals, all provide additional opportunities and incentives for excess consumption. People are eating more meals outside the home and in doing so they are consuming larger portions of food. For example, in the early 1970s about 20% of the American household food dollar was spent on food outside the home but by 1995 that amount had doubled to 40% (Putnam & Allshouse, 1996). Eating away from home, particularly at fast-food restaurants, is associated with higher calorie and fat intake (French, Harnack & Jeffery, 2000), and “eating out” is a significant contributor to weight gain and the increasing prevalence of overweight (Binkley, Eales & Jekanowski, 2000; McCrory et al., 1999).

Sedentary lifestyle also appears to be a significant contributor to overweight and obesity. Few occupations now require vigorous levels of physical activity. Moreover, labor-saving devices such as cars, elevators, escalators, motorized walkways, and remote controls, have had a significant cumulative impact in decreasing daily energy expenditure (Hill, Wyatt & Melanson, 2000; James, 1995). At the same time, levels of leisure time physical activity may have decreased as people spend more time in sedentary pursuits such as watching television and using computers rather than participating in physical pursuits that require greater amounts of energy expenditure. According to the US Centers for Disease Control (CDC, 2001), fewer than 1 in 4 adults engages in the recommended amounts of leisure time physical activity, and nearly 29% of the American population is totally sedentary.

Thus, the current epidemic of obesity may typify a “disease of civilization” resulting from the discordance between modern lifestyle and the lifestyles for which humans (and our genes) evolved over tens of thousands of years (Eaton & Konner, 1985). Decreases in physical activity and energy expenditure coupled with increases in exposure to an over-abundant supply of energy-dense foods have produced the dramatic worldwide rise in the prevalence of overweight and obesity.

TREATMENTS FOR OBESITY

Self-Management of Body Weight

In the USA, surveys indicate that substantial numbers of adults are trying to lose weight. At any given point in time, about 44% of women and 29% of men report that they are dieting to lose weight (Serdula et al., 1999). The most common way that people attempt to
regulate their body weight is through self-managed efforts to change their eating and activity patterns (Jeffery, Adlis & Forster, 1991). Self-management strategies include bibliotherapy, computer-assisted interventions, and self-help groups, and represent the most cost-effective methods of weight loss (Latner, 2001).

Some formerly overweight and obese individuals are very successful at weight management. In the USA, the National Weight Control Registry (NWCR) was founded in 1994 to study the strategies of successful maintainers of weight loss (Wing & Hill, 2001). More than 3000 individuals who have maintained a loss of 30 lb or more for at least one year are currently enrolled in the registry, and approximately 45% achieved their weight loss through self-management strategies (Wing & Hill, 2001). Successful maintainers commonly use three strategies for weight management. First, they regularly consume a low-calorie diet (i.e., <1400 kcal/day) that is low in fat (<25%) and high in carbohydrates (>55%). Second, they regularly engage in high levels of physical activity, about one hour per day of moderate activity such as brisk walking. Third, they regularly monitor their body weight: 44% weigh themselves daily and 31% weigh themselves at least once per week.

Obese individuals who seek professional assistance for weight loss tend to exhibit higher levels of distress and more pathological eating patterns compared to overweight persons in the general population (Fitzgibbon, Stolley & Kirschenbaum, 1993). At the current time, three major types of interventions are available to the obese person seeking professional assistance for weight management. These include behavioral or lifestyle treatment, pharmacological treatment, and bariatric surgery.

**Behavioral Treatment**

Behavior modification procedures have become the foundation of lifestyle interventions for weight loss (Wadden & Foster, 1992). Participants in behavioral treatment are taught to modify their eating and exercise habits so as to produce weight loss through a negative energy balance (i.e., the consumption of fewer calories than are expended). The key components typically used in behavioral interventions include: (a) goal-setting and daily self-monitoring of eating and physical activity; (b) nutritional training aimed at the consumption of a balanced low-calorie diet (i.e., typically 1000–1500 kcal/day) sufficient to produce a weight loss of 0.5 kg per week; (c) increased physical activity through the development of a walking program and/or increased lifestyle activities; (d) arrangement of environmental cues and behavioral reinforcers to support changes in eating and exercise behaviors; (e) cognitive restructuring techniques to identify and change negative thoughts and feelings that interfere with weight-loss progress; and (f) training in problem-solving or relapse prevention procedures to enhance coping with setbacks and obstacles to progress.

Reviews of randomized trials (Jeffery et al., 2000; NHLBI, 1998; Perri & Fuller, 1995; Wadden, Sarwer & Berkowitz, 1999) show that behavioral treatment is safe and effective. Typically delivered in 15–26 weekly group sessions, such interventions produce mean losses of approximately 8.5 kg or approximately 9% reduction in body weight (Renjilian et al., 2001). Attrition rates over six months average less than 20%, and negative side-effects are rare. Improvements in blood pressure, glucose tolerance, and lipid profiles are commonly

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1 The use of very low calorie diets (i.e., <800 kcal/day) in behavioral treatment increases initial weight loss but does not produce greater long-term reductions than the use of low calorie diets (Wadden, Foster & Letizia, 1994).
observed, and participants often report decreases in depressive symptoms (NHLBI, 1998; Pi-Sunyer, 1999). Thus, behavioral treatment is recommended as the first-line of professional intervention in a stepped-care approach to the management of overweight and obesity (NHLBI, 1998).

However, the long-term effectiveness of lifestyle interventions has remained an area of considerable concern. During the year following behavioral treatment, participants typically regain 30–40% of their lost weight (Jeffery et al., 2000; Wadden & Foster, 2000). Perri and Corsica (2002) recently summarized the results of behavioral treatment studies with follow-ups of two or more years and found a reliable pattern of gradual weight regain during the years following behavioral treatment. Nonetheless, the data show a mean weight loss of 1.8 kg from baseline to follow-up conducted on average 4.3 years after treatment.

When evaluating the long-term results of weight-loss interventions, several factors should be taken into account. Small net losses at long-term follow-up should be viewed in the context of what might have happened if the obese individual had never entered treatment. The natural course of weight change in untreated obese adults entails steady weight gain of about 0.5 kg per year (Shah, Hannan & Jeffery, 1991). Thus, long-term findings that show the maintenance of a small weight reduction may represent relatively favorable outcomes. In addition, the examination of group means can mask beneficial outcomes achieved by subgroups within study samples. For example, Kramer et al. (1989) found that 20% of their obese subjects succeeded in maintaining weight losses of 5 kg or more, 4–5 years after the completion of behavioral treatment. Similarly, a recent review of lifestyle interventions for weight loss indicated an overall median long-term success rate of 15% (Ayyad & Andersen, 2000).

**Pharmacotherapy**

Over the past five years, there have been major changes in the medications available for weight loss. The serotoninergic agents, fenfluramine and dexfenfluramine, were withdrawn from the US market in 1997 due to their association with valvular heart disease (Connolly et al., 1997). In 2000, the over-the-counter weight-loss products containing the noradrenergic ingredient, phenylpropanolamine, were removed from the market due to concerns about increased risk of stroke (FDA, Nov. 6, 2000). However, other noradrenergic agents, phentermine, mazindol, and diethylpropion, remain available on a prescription basis. In addition, since 1997, two new drugs, sibutramine (Meridia®; Knoll Pharmaceutical Company, 2000) and orlistat (Xenical®; Roche Pharmaceutical Company, 2000) have been approved for the treatment of obesity.

Noradrenergic agents are centrally acting drugs that suppress appetite by stimulating catecholamine neurotransmission. In a review of 23 studies, Bray and Gray (1988) found that over the course of three months the combination of a noradrenergic drug plus low-calorie diet produced a mean weight loss of 6.2 kg, compared with a 2.9 kg loss for placebo plus diet. Longer-term studies of noradrenergic drugs show that weight lost in treatment is almost completely regained when the drug is withdrawn. Because this type of agent is approved only for short-term use (i.e., 2–3 months), its usefulness in the long-term management of obesity is questionable.

Sibutramine is a combined noradrenaline and serotonin reuptake inhibitor. Sibutramine enhances satiety and may also produce a small increase in basal metabolic rate (Hansen
et al., 1998). In controlled trials lasting 6–12 months, sibutramine (15 mg per day) produced mean weight loss of 6–7%, compared to 1–2% for placebo (Bray et al., 1999; Jones et al., 1995). Weight loss occurs in the first six months of use and tends to plateau thereafter. Sibutramine has also been used successfully as an adjunct treatment to enhance the effects of intensive dieting. For example, participants in one study who lost at least 6 kg through a 4-week very low calorie diet increased their weight losses by almost 100% using sibutramine (losing an additional 5.2 kg), whereas subjects receiving placebo gained a small amount of weight during the same period (Apfelbaum et al., 1999).

Sibutramine produces a modest mean increase in blood pressure (about 2 mmHg systolic and diastolic at the 15-mg dose). However, some users (approximately 17%) experience an increase of >10 mmHg in blood pressure. Such an increase represents a serious concern given that a 2 mm rise in diastolic blood pressure increases the risk of coronary heart disease by 6% and increases the risk of stroke by 15% (Cook et al., 1995). As such, those on sibutramine must have their blood pressure monitored frequently, and patients with a history of heart disease, stroke, hypertension, or other risk factors for heart disease must not take sibutramine (Hensrud, 2000; Knoll Pharmaceutical, 2000). Because obesity is frequently associated with elevated blood pressure, this potential increase in blood pressure effectively eliminates this drug as a treatment option for many overweight patients.

Unlike most anti-obesity drugs, which act on the central nervous system, orlistat is a gastric and pancreatic lipase inhibitor, which acts by preventing the digestion or absorption of 30% of dietary fat. In a large-scale, randomized-controlled trial (Davidson et al., 1999), treatment with diet plus orlistat (120 mg, 3 times a day) for two years produced a 7.6% weight loss, whereas treatment with diet plus placebo resulted in a 4.2% loss. Maximum weight loss with orlistat typically occurs after 8–12 months of treatment, and 25–30% of the weight lost during the first year is regained during the following year, even with continued treatment (Davidson et al., 1999; Sjöström et al., 1998). Nonetheless, weight loss after two years of treatment with diet plus orlistat remains significantly greater than treatment with diet plus placebo (Davidson et al., 1999). Orlistat also reduces the regaining of lost weight (Hill et al., 1999).

The major side effects of orlistat include abdominal pain, flatus with discharge, fecal urgency, oily stools, increased defecation, and fecal incontinence. These side-effects are reported by 20–50% of users (Roche Pharmaceutical Company, 2000). The consumption of excessive quantities of fat increases the risk of these side-effects. Thus, in effect, orlistat may condition users to avoid high levels of dietary fat through the aversive consequences of consuming fats. Because of the unpleasant nature of these side-effects, many obese individuals refuse to consider orlistat as a treatment option.

While both sibutramine and orlistat enhance weight-loss success, these agents should not be used as the sole element of obesity management. Weight-loss medications are more effective when used as part of a comprehensive treatment regimen including lifestyle modification than when they are used alone (Wadden et al., 2001). In a randomized trial, the authors compared the use of sibutramine only, sibutramine plus a behavioral lifestyle program, and sibutramine plus behavioral lifestyle program plus a 1000 kcal/day portion-controlled diet to evaluate the effect of the addition of lifestyle training on weight loss in the context of pharmacological treatment of obesity. After treatment for one year, patients who used sibutramine combined with a behavioral lifestyle program lost twice as much weight as did those who took sibutramine only (10.8% vs 4.1%). Weight loss was increased to an even greater extent by combining sibutramine with lifestyle modification and a portion-controlled diet.
(16.5% of initial weight—one of the largest mean weight losses reported in a randomized trial of weight-loss medication).

A current challenge with the new weight-loss medications is that their cost, at $120.00 per month, can be prohibitive for many obese patients. Despite empirical demonstrations of their safety and efficacy, weight-loss medications are rarely covered by insurance in the USA.

**Bariatric Surgery**

Class III obesity (BMI > 40), also known as “morbid obesity,” confers an extremely high risk for morbidity and decreased longevity. In the USA, morbid obesity affects about 3% of the population, approximately 12 million adults (Flegal et al., 1998). Because lifestyle and pharmacological interventions produce very limited benefits for these patients, bariatric surgery represents the treatment of choice for Class III obesity (Albrecht & Pories, 1999).

Gastroplasty and gastric bypass are the two major surgical procedures for weight loss. In vertical banded gastroplasty, the stomach is stapled to create a small vertical “pouch.” This gastric pouch limits the amount of food that can be ingested in a single eating period to about 15 ml. A ring with a diameter of 9–10 mm is placed at the outlet of the pouch to slow the rate at which food passes through the remainder of the stomach and into the duodenum and jejunum (small intestine). Gastroplasty exerts a regulatory effect on eating behavior through aversive conditioning. Eating more than the small amount of solid food that the stomach pouch can accommodate typically results in vomiting, which provides a disincentive for overeating. Gastroplasty does not, however, provide a mechanism to limit the consumption of high-calorie liquids or soft foods. Consequently, as many as 30% of patients who have this surgery engage in the overconsumption of such foods (i.e., “soft calorie syndrome”), resulting in poor weight-loss outcome (Kral, 1989). An additional problem with gastroplasty is that over time the size of the pouch may expand, thereby limiting its long-term effectiveness.

The more effective Roux-en-Y gastric bypass procedure creates a small gastric pouch via stapling, and a limb of the jejunum is attached directly to the pouch. Ingested food bypasses 90% of the stomach, the duodenum, and a small portion of the proximal jejunum (Kral, 1995). The surgery facilitates weight loss in three ways. First, the pouch can only hold a small amount of food (15 ml), and overfilling the pouch results in regurgitation. Second, the emptying of partially digested food from the pouch into the small intestine results in malabsorption, (i.e., a portion of calories consumed are not absorbed). Third, the consumption of sweets and foods containing refined sugar produces aversive consequences including nausea, light headedness, sweating, palpitations, and gastrointestinal distress. This constellation of symptoms, referred to as the “dumping syndrome”, serves as a deterrent to the consumption of sweets.

Due to its superior weight-loss outcome, gastric bypass has replaced gastroplasty as the preferred type of bariatric surgery (Balsiger et al., 2000). Glenny and colleagues (Glenny et al., 1997) found that typical weight losses one year after gastric bypass ranged from 45 to 65 kg, whereas gastroplasty resulted in 30–35 kg weight loss. Similarly, the two-year follow-up of a large-scale trial of bariatric surgery in Sweden (Sjöstrom, Lissner, Wedel & Sjöstrom, 1999) found that patients who received gastric bypass had a 33% reduction in body weight compared to 23% for patients with gastroplasty. While long-term studies
show some regaining of weight (about 5–7 kg over five years), gastric bypass patients commonly maintain 80–90% of their initial weight losses (Balsiger et al., 2000), making it by far the most successful treatment of obesity over the long term. Gastric bypass reduces or eliminates the major comorbid conditions experienced by severely obese patients, including hypertension, diabetes, dyslipidemia, asthma, and sleep apnea (Kral, 1995; Long et al., 1994; NIH, 1992). In addition, significant improvements in quality of life routinely accompany the large weight losses achieved by bariatric surgery patients (NIH, 1992). Along with its greater successes, however, come greater risks, including a mortality rate of approximately 0.5%, postoperative complications, micronutrient deficiencies, and late postoperative depression (NIH, 1992; Sjöstrom, Narbro & Sjöstrom, 1995).

MAINTENANCE STRATEGIES

With the exception of surgery, virtually all treatments for obesity show limited long-term effectiveness. A combination of physiological factors, such as reduced metabolic rate (Dulloo & Jacquet, 1998; Ravussin & Swinburn, 1993), and environmental factors, such as continuous exposure to an environment rich in tasty high-fat, high-calorie foods (Hill & Peters, 1998) prime the dieter to regain lost weight. This challenging combination of physiological and environmental barriers, in addition to psychological variables such as decreased motivation, makes long-term success a very difficult proposition. It is perhaps not surprising that most overweight individuals experience difficulties after completing weight-loss treatment. The most reinforcing aspect of treatment is weight loss, and weight loss generally slows or stops well before most patients reach their “desired” losses. As a result, many perceive a high behavioral “cost” associated with continued efforts at weight control precisely at the same time they are experiencing diminished “benefits” in terms of little or no additional weight loss. Weight regain often leads to attributions of personal ineffectiveness that can trigger negative emotions and a sense of hopelessness, resulting in an abandonment of the weight-control effort (Goodrick et al., 1992; Jeffery, French & Schmid, 1990).

Over the past 15 years, researchers have examined a wide array of strategies to improve long-term outcome in obesity treatment. These include: extended treatment, skills training, peer support, exercise/physical activity and multicomponent post-treatment programs. In Table 10.2, we summarize the apparent effectiveness of these strategies. In the following sections we describe those approaches that have been effective in improving long-term outcome.

Extended Treatment

Improving the long-term effectiveness of treatment involves finding ways to assist clients in sustaining key changes in the behaviors that regulate energy balance and weight loss. Perri and Corsica (2002) recently reviewed the results of 13 studies in which behavioral treatment was extended beyond six months, through the use of weekly or biweekly treatment sessions, for up to one year. Groups that received behavior therapy with extended contact succeeded in maintaining 96% of their initial losses, whereas groups without extended contact maintained about 67% of their initial weight reductions. Follow-up visits conducted nearly two years after treatment initiation showed that while the extended treatment group maintained 66%
Table 10.2  Strategies designed to improve long-term outcome

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Beneficial effect at 6–12 months</th>
<th>Beneficial effect at &gt;13 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extended therapy</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Extended therapy (weekly/biweekly group sessions up to one year)</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>Therapist contact by phone/mail</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>Telephone prompts by non-therapists</td>
<td>No</td>
<td>Unknown</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervised exercise</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Use of personal trainers</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Financial incentives</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Home-based exercise</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>Short-bout exercise + home exercise equipment</td>
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<td>Unknown</td>
</tr>
<tr>
<td>Portion-controlled meals</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Optional portion-controlled meals</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Skills training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPT: initial treatment</td>
<td>No</td>
<td>Unlikely</td>
</tr>
<tr>
<td>RPT with post-treatment therapist contacts</td>
<td>Mixed</td>
<td>Unknown</td>
</tr>
<tr>
<td>Social support training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer support training</td>
<td>No</td>
<td>Unlikely</td>
</tr>
<tr>
<td>Social support training for clients recruited with friends or relatives</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>Multicomponent programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapist contact + increased exercise</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Therapist contact + social support</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Therapist contact + increased exercise + social support</td>
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<td>Yes</td>
</tr>
<tr>
<td>Therapist contact + portion control foods</td>
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<td>Yes</td>
</tr>
<tr>
<td>Therapist contact + pharmacotherapy</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
<tr>
<td>Therapist contact + pharmacotherapy + portion-controlled meals</td>
<td>Yes</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Adapted and updated from Perri et al. (2001).

of their initial reductions, those without extended contact maintained only 38% of their initial reductions. Collectively, these data strongly suggest extended treatment improves long-term outcome, a conclusion consistent with the findings of an independent review of long-term success in obesity treatment (Ayyad & Andersen, 2000).

Relapse Prevention Training

Relapse prevention training (RPT) involves teaching participants how to avoid or cope with slips and relapses (Marlatt & Gordon, 1985). Studies of the effectiveness of RPT on long-term weight management have revealed mixed results. While the inclusion of RPT during initial treatment has not been found to be effective, combining RPT with
a post-treatment program of client–therapist contacts has improved the maintenance of weight loss in some studies (Baum, Clark & Sandler, 1991; Perri et al., 1984b). However Perri et al. (2001) recently compared RPT and problem-solving therapy (PST) as year-long extended treatments for weight loss. PST showed better long-term outcome than the control group, but RPT did not. RPT in this study was administered as a standardized didactic program; it may be more effective when applied as an individualized therapy (Marlatt & George, 1998).

**Telephone Contact**

Post-treatment telephone contact may represent a more efficient mode of providing active follow-up care than in-person sessions. However, the use of telephone contact has yielded mixed results. Perri et al. (1984b) found that post-treatment contacts by telephone and mail significantly improved the maintenance of lost weight, but Wing et al. (1996) failed to find a beneficial effect from telephone prompts alone. However, these two studies differed in ways that may help to explain these divergent findings. In the Perri et al. (1984b) study, the clients’ therapists made the phone calls and provided counseling about ways to cope with problems related to the maintenance of lost weight. In contrast, the contacts in the Wing et al. (1996) study were made by callers unknown to the clients who did not offer advice but simply prompted the clients to continue their self-management efforts. Telephone contact may be more effective when it includes an opportunity for counseling by the treatment provider with whom the client has a relationship.

**Peer Support**

Perri et al. (1987) examined the effects of post-treatment peer support program compared to a post-treatment therapist support program and to a control condition that received no post-treatment contact. An 18-month follow-up assessment suggested a trend toward better maintenance of weight lost in both the peer-support and therapist contacts groups compared with the control condition. The effect of treating participants alone or with three friends or family members was recently tested by Wing and Jeffery (1999). The researchers used a partially randomized study design in assigning subjects (recruited alone versus with friends) to receive either standard behavior therapy or behavior therapy with social support training. The results of a relatively short follow-up (i.e., six months) indicated that the combination of joining with friends and receiving social support training significantly improved the maintenance of lost weight. These two studies (Perri et al., 1987; Wing & Jeffery, 1999) suggest a beneficial, albeit modest, effect for social support in long-term weight management.

**Portion-Controlled Meals**

Can long-term weight control be improved through the use of portion-controlled meals? Jeffery and his colleagues (1993) provided obese patients with prepackaged, portion-controlled meals (10 per week at no cost) during initial treatment and the following year. Participants in the food provision groups showed significantly greater weight losses than
those without food provision both during initial treatment and during the subsequent 12 months. However, the results of an additional 12-month follow-up, without food provision, revealed a significant regaining of weight (Jeffery & Wing, 1995). In a subsequent study, Wing et al. (1996) found that simply providing participants with the “opportunity” to purchase and use portion-controlled meals as a maintenance strategy was not effective, largely because the participants elected not to purchase the portion-controlled meals. Taken together, these studies show that the use of portion-controlled meals may be an effective maintenance strategy only when the meals are provided to participants at no cost. Consistent with these findings, Flechtner-Mors et al. (2000) found excellent long-term maintenance of lost weight for participants who were provided with extended treatment (i.e., monthly clinician contacts) and with no-cost portion-controlled meals and snacks (7 meals and 7 snacks per week) over the course of a 48-month period.

Exercise/Physical Activity

Long-term weight loss is often associated with high levels of physical activity (e.g., Harris et al., 1994; McGuire et al., 1999; Sherwood, Jeffery & Wing, 1999; Wing & Hill, 2001). Nonetheless, an important question remains as to whether the addition of exercise/physical activity to dietary change can improve long-term weight loss. Wing (1999) reviewed six randomized-controlled trials that addressed this question. Only two of the studies showed significantly better maintenance of lost weight for the diet plus exercise condition versus diet alone; however, the direction of the findings in the four remaining studies suggested a favorable effect for the inclusion of exercise. The modest effects for the addition of exercise may have been due to several factors, including the short duration of the interventions, the relatively small amounts of exercise prescribed, and, most importantly, inconsistent adherence to the physical activity prescriptions. Given the obvious potential benefits of exercise in the management of obesity, a variety of strategies to improve exercise adherence have been examined including home-based exercise, the use of short bouts of exercise, the provision of home exercise equipment, monetary incentives for exercise, and follow-up programs focusing exclusively on exercise. We review each of these strategies next.

Several studies have demonstrated greater adherence to home-based exercise regimens compared with supervised group exercise (King et al., 1991; Perri et al., 1997). Moreover, Perri and colleagues (1997) found that participation in home-based exercise resulted in improvements in other domains including better attendance at treatment sessions, increased self-monitoring of food intake, and better long-term maintenance of lost weight. Similarly, Jeffery et al. (1998) also found that participants in a home-based exercise regimen showed superior maintenance of lost weight compared to those in supervised group-based exercise. Thus, the greater convenience and flexibility of home-based exercise may produce higher levels of exercise adherence, and continued participation in exercise may produce better adherence to other weight-control strategies and better maintenance of lost weight as well.

Adherence to home-based exercise routines may be enhanced by providing participants with exercise equipment and by allowing them to exercise in brief bouts. Jakicic et al. (1999) tested the effects of short-bout versus long-bout exercise (i.e., four 10-minute bouts per day versus one 40-minute bout per day) and the use of home exercise equipment (treadmills) on adherence, weight loss, and fitness. Benefits from exercise in short or long bouts were equivalent—an important finding for people who have difficulty finding time in their schedules for a longer bout of exercise. Further, participants who were provided
with home exercise equipment maintained significantly higher levels of long-term exercise adherence and weight loss compared to subjects without exercise equipment.

Some exercise-related strategies have not proven to be helpful to weight management. For example, the use of personal exercise trainers and financial incentives for exercise completion\(^2\) have improved attendance at supervised exercise sessions but have not increased weight loss (Jeffery et al., 1998). A focus on exercise alone as a maintenance strategy may not be sufficient to improve long-term weight control. For example, Leermakers et al. (1999) compared a maintenance program that focused exclusively on exercise adherence with a program that focused more generally on the maintenance of lost weight. A 12-month follow-up showed poorer maintenance of lost weight in the program that focused exclusively on exercise—a finding that highlights the necessity of focusing on dietary intake as well as energy expenditure for successful long-term weight management.

**Multicomponent Post-treatment Programs**

Several studies have demonstrated the effectiveness of post-treatment programs with multiple components. As noted previously, Flechtner-Mors et al. (2000) found excellent long-term maintenance of lost weight for participants who were provided with a multicomponent program consisting of extended treatment combined with no-cost, portion-controlled meals and snacks, and Wadden et al. (2001) demonstrated the effectiveness of combining lifestyle modification with pharmacotherapy and portion-controlled meals. Two studies (Perri et al., 1986; Perri et al., 1984a) have shown that multicomponent post-treatment programs consisting of peer group meetings combined with ongoing therapist contacts by mail and telephone improved the maintenance of lost weight compared to control conditions without follow-up care. Finally, Perri et al. (1988) examined the effects of adding increased exercise and a social influence program (or both) to a post-treatment therapist contact program consisting of 26 biweekly group sessions. Compared to a control condition that received behavioral therapy without post-treatment contact, all four post-treatment programs produced significantly greater weight losses at an 18-month follow-up evaluation. Collectively, the four maintenance groups succeeded in sustaining on average 83% of their initial weight losses, compared to 33% for the group without a post-treatment program. A common element in multicomponent programs is the addition of therapist contact following an initial period of weight-loss treatment. In most but not all studies (e.g., Perri et al., 2001), providing clients with follow-up care has resulted in improved maintenance of lost weight (Perri & Corsica, 2002). Such findings underscore the importance of programming a regimen of long-term care in the treatment of obese patients.

**CLINICAL MANAGEMENT**

We advocate four key elements in the clinical management of obesity. First, we argue for a greater recognition by clinicians and the general public of the nature of obesity as a serious health problem. Next, prior to undertaking treatment of obesity, we recommend a comprehensive assessment to determine risk of compromised health and quality of life.

\(^2\) Similarly, the use of financial incentives for weight loss in behavioral treatment has not increased the magnitude of weight reductions during initial treatment (Jeffery et al., 1993).
and to identify appropriate targets for intervention. Third, we advise matching treatments to patients based on the patient’s weight status as well as other targets requiring change. Lastly, we argue for a “continuous care” approach which provides the overweight patient with long-term assistance in the management of obesity.

Recognizing the Nature of the Problem

Part of the difficulty in managing obesity stems from a failure to recognize not only its seriousness but also the contributors to its development and the options available for its treatment. In recent years, the detrimental impact of excess body weight has become increasingly apparent. For example, as a direct consequence of the dramatic rise in obesity among young people, type 2 diabetes mellitus, a disease most commonly seen in middle-aged obese adults, is now being observed in obese teenagers and young adults (Caprio & Tamborlane, 1999). Yet despite the ominous consequences of obesity, health care practitioners rarely provide overweight patients with advice about weight loss (Sciamanna et al., 2000). Moreover, when such advice is given, it is provided primarily to those who are already significantly obese, are middle-aged, and have comorbid conditions such as diabetes or hypertension (Sciamanna et al., 2000). Such findings suggest that health care providers may be missing significant opportunities to counsel overweight persons to lose weight or to maintain their weight and thereby avoid the development of comorbid conditions.

A greater awareness of the contribution of lifestyle factors to weight gain is also needed. Indeed, sedentary lifestyle and increased consumption of high fat foods constitute the major contributors to the increased prevalence of obesity. Accordingly, we must recognize those elements of our environment, at home, school, and work, that foster unhealthy patterns of eating and physical activity. Furthermore, we must acknowledge the necessity of environmental and lifestyle modifications to redress the problem.

Greater recognition must also be given to the range of empirically supported treatment options available for weight management. A common misconception, popular among many patients and health care providers, is that control of body weight represents a futile endeavor (Wilson, 1994). This perception stems largely from observations of relapse following treatment of obesity. It fails to take into account the fact that most obese people who experience relapses in weight management remain significantly lighter than their untreated overweight peers, who typically show a pattern of steady weight gain (Field et al., 2001; Shah et al., 1991). It also fails to take into account that among those treated for obesity, a substantial proportion (15–20%) demonstrate clear-cut, long-term success (Ayyad & Andersen, 2000; Kramer et al., 1989). In addition, substantial long-term weight losses accompanied by significant improvements in health are experienced by the overwhelming majority of morbidly obese patients who undergo bariatric surgery (MacDonald et al., 1997; Sjöstrom, Narbro & Sjöstrom, 1995).

Identifying Appropriate Targets for Change

An effective treatment plan for the obese person should begin with a comprehensive assessment of the effects of obesity on the individual’s health and emotional well-being (Beliard, Kirschenbaum & Fitzgibbon, 1992; Kushner & Weinsier, 2000). In addition to a physical examination that specifically assesses risk for common comorbidities of obesity,
such as diabetes, dyslipidemia, and hypertension, the initial assessment should also include
an evaluation of relevant behavioral and psychological factors, such as sedentary lifestyle,
consumption of a poor-quality diet, binge eating, body image dissatisfaction, unrealistic
weight-loss expectations, and symptoms of anxiety and depression. Each of these problems
may represent an important target for change (Perri, Nezu & Viegener, 1992; Wadden &
Foster, 1992), independent of a reduction in body weight.

Moreover, treatment goals should be framed in terms of behaviors that obese persons can
control, such as the quantity and quality of food they consume and the amounts and types of
physical activity they perform. Successful outcome in the care of the obese person should not
be viewed solely in terms of weight loss. In some cases, the prevention of further weight gain
may represent an appropriate goal of treatment. Beneficial changes in risk factors for disease
and improvements in quality of life (Atkinson, 1993) often represent important indicators of
success. Improvements in the quality of diet should be a component of care independent of
whether weight reduction is an identified objective of care (Hill, Drougas & Peters, 1993).

Reductions in amounts of dietary fats, particularly saturated fats, can improve health as well
as assist in weight loss (Insull et al., 1990; NHLBI, 2001). Similarly, increased physical
activity and a decrease in sedentary lifestyle can represent beneficial components of long-
term care irrespective of the impact of exercise on weight loss (Lee, Blair & Jackson, 1999;
Leermakers, Dunn & Blair 2000). Finally, self-acceptance, independent of body weight,
may also be a significant indicator of success in the psychological treatment of the obese
person (Wilson, 1996).

Matching Treatments to Patients

We recommend that an initial treatment plan be devised and based on consideration of
the range of appropriate treatment options that take into account both the patient’s weight
status and individualized targets for change identified by a comprehensive pretreatment
assessment. Guidelines for a stepped-care approach for matching treatments to patients
based on the severity of obesity and the presence of comorbid conditions have been described
in several recent reports (NHLBI, 1998; WHO, 1998; see Table 10.3).

Table 10.3 A stepped-care approach to weight management

<table>
<thead>
<tr>
<th>BMI</th>
<th>Presence of weight-related comorbidity</th>
<th>Recommended steps</th>
<th>Weight goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>—</td>
<td>Self-management</td>
<td>Prevention of weight gain</td>
</tr>
<tr>
<td>25–29.9</td>
<td>No</td>
<td>1. Self-management</td>
<td>5–10% reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Lifestyle intervention</td>
<td></td>
</tr>
<tr>
<td>27–29.9</td>
<td>Yes</td>
<td>1. Lifestyle intervention</td>
<td>5–10% reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Lifestyle + pharmacotherapy</td>
<td>5–10% reduction</td>
</tr>
<tr>
<td>30–39.9</td>
<td>No</td>
<td>1. Lifestyle intervention</td>
<td>10% reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Lifestyle + pharmacotherapy</td>
<td>10% reduction</td>
</tr>
<tr>
<td>35–39.9</td>
<td>Yes</td>
<td>1. lifestyle + pharmacotherapy</td>
<td>10% reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Bariatric surgery</td>
<td></td>
</tr>
<tr>
<td>≥40</td>
<td>—</td>
<td>Bariatric surgery</td>
<td>≥25% reduction</td>
</tr>
</tbody>
</table>
For people in the desirable weight range (i.e., BMI of 18.5–24.9), we recommend the prevention of weight gain and the maintenance, or if necessary the development, of healthy eating patterns and a physically active lifestyle. Indeed, high-fat diets and sedentary lifestyles represent increased risks for disease even in the absence of excess body weight (Blair & Brodney, 1999; Office of Disease Prevention and Health Promotion, 2000). For those in the overweight or obese Class I or II categories, lifestyle interventions represent the first line of treatment. In most cases, treatment goals typically will entail modification of eating and exercise behaviors so as to produce weight losses of 0.5–1.0 kg per week. Lifestyle or behavioral interventions can be expected to produce reductions of 5–10% in body weight (NHLBI, 1998). Losses of this magnitude are sufficient to produce clinically significant changes in risk for disease (Pi-Sunyer, 1999). The addition of pharmacotherapy to behavioral treatment may enhance the effectiveness of weight management efforts (Wadden et al., 2001). The combination of pharmacotherapy and behavioral treatment is generally reserved for those with a BMI in excess of 30 for whom lifestyle intervention alone has not produced adequate results. However, the presence of significant comorbidities may justify consideration of pharmacotherapy in patients with BMIs as low as 27. For patients with Class III obesity (i.e., BMI > 40), bariatric surgery represents the treatment of choice. Here also, the presence of significant comorbidities may justify consideration of surgery in patients with BMIs as low as 35.

**Adopting a Lifelong Perspective**

We believe that obesity should be viewed as a chronic condition requiring long-term, if not lifelong, care. The clinical challenge is not to persuade obese people that they need to be in treatment forever. Rather the challenge is to convince the overweight people that successful management of their weight will require constant vigilance and ongoing efforts at self-management of eating and exercise behaviors (Perri, Nezu & Viegener, 1992). Although weight management may become somewhat easier over time (McGuire et al., 1999), it is always likely to entail conscious efforts to maintain behavioral control of one’s energy balance (Wing & Hill, 2001). In a compassionate manner, health providers must communicate to their obese patients not merely a recognition of the chronicity of the problem, but also an empathic understanding of the emotional aspects of what it means to be obese in a culture that values thinness.

Finally, clinicians need to assure obese patients of their ready availability to assist in the long-term management of weight and related issues. Indeed, the maintenance of weight loss is more likely to occur when clients are provided with interventions specifically designed to enhance long-term progress (e.g., Björvell & Rössner, 1992). Moreover, the most important maintenance strategy may consist of long-term clinical contact (Perri & Corsica, 2002). Such contact promotes vigilance to diet and exercise and provides opportunities for active problem-solving of obstacles to long-term success.

**SUMMARY**

Over the past two decades, the rates of overweight and obesity in the industrialized world have increased at an alarming pace. Obesity confers increased risk for morbidity and
mortality and thereby constitutes a major public health problem. Although genetic factors may predispose some individuals to obesity, environmental factors comprise the major contributors to the current epidemic of overweight. Continuous exposure to an overabundance of high-calorie and high-fat foods coupled with decreased occupational and leisure time physical activity have resulted in the significant increases in body weights observed over the past two decades.

Weight loss can reverse many of the disadvantages associated with obesity, and progress has been made in the development of effective weight-loss treatments. Behavioral or lifestyle interventions that focus on moderate reductions in caloric intake, combined with increased energy expenditures through physical activity, produce weight reductions of sufficient magnitude to decrease the risk for many diseases. Moreover, new pharmacological agents can enhance the effectiveness of lifestyle interventions, and gastric bypass surgery now provides a viable treatment option for the very severely obese.

In spite of the considerable progress in producing clinically significant weight losses, all weight-loss interventions (with the possible exception of surgery) suffer from the problem of poor long-term maintenance of lost weight. However, providing obese patients with extended treatment and with long-term follow-up care has shown some benefit in this regard. The implementation of strategies to promote continued vigilance and adherence to changes in diet and physical activity may be required for long-term success in the management of obesity.

REFERENCES


TREATMENT OF OBESITY


TREATMENT OF OBESITY


